MET 210W
Project 2: Speed Reduction Gear Box

Working in teams of two or three students, design the double-reduction gear box represented in the figure below. The centerline of all three shafts should lie in the same plane.

**GEARS:**
- Use straight spur gears or helical gears
- Service factor is 1.25
- Select the gears from Boston Gear or other catalog
- Use keys to keep the gears from rotating with respect to the shaft
- Need a summary sketch for each chosen gear.
  Specify: gear catalog number and item code
  material
  diametral pitch
  number of teeth
  pitch diameter, D
  face width, F
  bore
  hub diameter and projection
  pressure angle
  keyway dimensions

**SHAFTS:**
- Each power transmission element is restrained with keys
- Pick appropriate methods for constraining the gears axially. (shoulders, retaining rings, etc.)
- Torsion only at input and output through keys in sled runner keyways
- Select diameters for all critical points along the shaft length.
- Verify that the size of all other elements dimensionally fit with the shafts.
- Need a summary sketch of each shaft. Show a cross-section through each keyway, specifying the appropriate dimensions.
  Specify: lengths
  diameters
  groove widths and depths
  fillet radii
  chamfer sizes
  keyway dimensions
  material
EXTERNAL RETAINING RINGS:
- Specify: McMaster-Carr part number (www.mcmaster.com)
  Include a printout of the catalog – pg. 3218
  Highlight selected rings
  Make sure the grooves in the shaft will fit the selected rings

BEARINGS:
- Select appropriate Timken Conrad type ball bearings for the gear box. Likely to be Light 200K (pg D14) or Medium 300K (pg. D22) series.
- Print the catalog page for the selected bearings. Highlight the specified bearings. The catalog is available on ANGEL.

KEYS:
- Design keys for each of the gears
- Specify: width x height x length
  material
  keyway dimensions in hubs and shafts

HOUSING:
- Compute the minimum internal dimensions of the housing, providing 1/8” clearance with the gears.
- Show support structure for each of the bearings

SOLID MODEL:
- Model each of the parts and create an assembly model.
  - Gears are disks having outer diameter equal to the pitch diameter of the gear
  - Bearings can be a single feature with OD, ID, and width
  - Retaining ring models can be similar to bearings
  - Shafts should reflect the dimensions derived from the design
- Create a general assembly drawing complete with parts list and item number balloons. Make it a single orthographic section view cut through the shafts.
  - Use B-size sheet, but print the drawing on A-size paper
  - 1/8” high text – all caps.
  - Filled arrows, 1/8” long by 1/24” wide
  - 3/8” diameter balloons
  - Do not cross-hatch shafts, rings, keys or bearings.
  - Show critical dimensions

CALCULATIONS:
- All calculations are to be neatly done on engineering calculation paper
- Show all formulas symbolically, substitute values with units, answer with units
- Provide headings for each step to make the calculations easy to follow.
- Sketches are helpful to make it clear what is being designed.

WRITTEN WORK:
- Write a memo to the instructor indicating who the team members are for your group. Include a brief description of the work each student will complete. Describe how your group plans to complete this design by the deadline.

RESOURCES:
- You may use your text and other books from the library to complete this project. You may also utilize applicable online resources. You may consult with the MET210W faculty. Please try to limit questions to other faculty members.

DUE DATE:
- May 1, 2009 at 5 pm.